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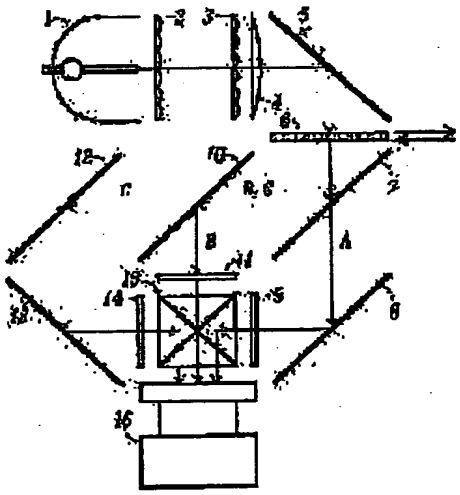
(54) LIQUID CRYSTAL PROJECTOR DEVICE

(57)Abstract:
PROBLEM TO BE SOLVED: To obtain a device equipped with a plurality of spectroscopic methods for three primary colors so that the device can be switched between for display with high luminance and for reproduction of highquality colors.
SOLUTION: Rays from a light source 1 are condensed by integrator lenses 2, 3 and a lens 4 and spectrally divided into three primary colors by dichroic mirrors 7, 10 to illuminate three liquid crystal panels 9, 11, 14, and the modulated rays are synthesized by a dichroic prism 15 and projected by a projecting lens 16 onto a screen. A filter 6 having such characteristics that it cuts the edge part of the wavelength region of each color of the three primary colors is inserted into the optical path prior to the spectral division for the high-quality reproduction of colors so that the liquid crystal panel is irradiated with light of colors with high purity. For the image display with high luminance, the filter is retrieved from the optical path so that the liquid crystal panel is irradiated with rays in the whole wavelength region of each color. Or, the wavelength region of irradiating rays can be switched between narrow and wide ranges by electrically controlling mirrors 8, 13 and the dichroic mirror 10.



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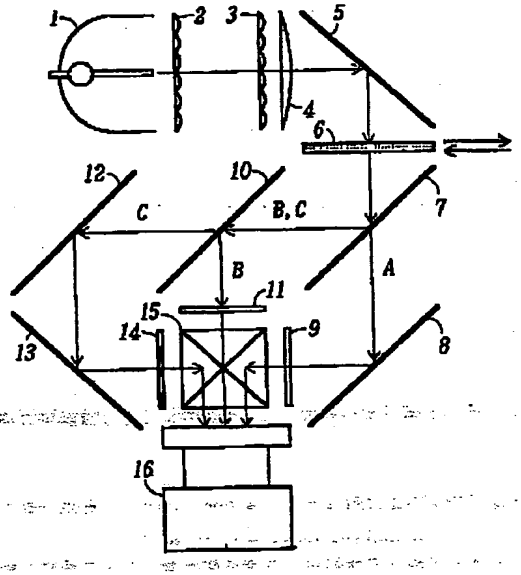
5C060 GB06 HC16 HC24 HC25 JA11 JA18

(54)【発明の名称】　液晶プロジェクタ装置

(57)【要約】
【課題】　三原色の分光方法を複数備え、装置を高輝度表示用と高色彩再現用とに切換える。
【解決手段】　光源１からの光線をインテグレータレンズ２、３、レンズ４で集光し、ダイクロイックミラー７、10で三原色に分光し、三枚の液晶パネル９、11、14を照射し、光変調された光線をダイクロイックプリズム15で合成し、投写レンズ16でスクリーンに投写する。フィルタ６は三原色の各色のそれぞれの波長領域の端部をカットする特性のもので、高色彩再現用のときはこのフィルタを分光前の光路に挿入し、純度の高い色が液晶パネルを照射するようにし、高輝度画像表示用のときはフィルタを光路から外し、各色の全波長領域の光線が液晶パネルを照射するようにする。または、ミラー８、13、ダイクロイックミラー10の電気的な制御で照射光線の波長領域を狭・広に切換えるようにする。



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【特許請求の範囲】

【請求項１】　光源からの白色光線を赤、緑および青の光線に分光する分光部と、分光部よりの赤、緑および青の光線を赤、緑および青色用の三枚の液晶パネルに照射し、光変調し、赤、緑および青の映像光線を出射する液晶パネル部と、液晶パネル部よりの赤、緑および青の映像光線を合成し投写する投写部とからなるものにおいて、前記分光部への光路に、赤、緑および青の各色の波長領域の端部領域をカットする第１フィルタを挿抜自在に設け、第１フィルタの挿抜で高色彩再現用と高輝度表示用とを切換えるようにした液晶プロジェクタ装置。

【請求項２】　光源からの白色光線を赤、緑および青の光線に分光する分光部と、分光部よりの赤、緑および青の光線を赤、緑および青色用の三枚の液晶パネルに照射し、光変調し、赤、緑および青の映像光線を出射する液晶パネル部と、液晶パネル部よりの赤、緑および青の映像光線を合成し投写する投写部とからなるものにおいて、赤、緑および青の各色の波長領域の端部領域をカットするフィルタ素子を、光源からの光線を集光するためのインテグレータレンズのレンズ素子のピッチと同じピッチでガラス板上に配設して第２フィルタを形成し、第２フィルタを前記インテグレータレンズとインテグレータレンズからの光線の直線偏光成分の取出しを行う第１ＰＢＳ（偏光ビームスプリッタ）との間に配置し、第２フィルタを、高色彩再現用のときは光路にフィルタ素子が介挿され、高輝度表示用のときは光路にフィルタ素子が介挿されないように移動するようにした液晶プロジェクタ装置。

【請求項３】　光源からの白色光線を赤、緑および青の光線に分光する分光部と、分光部よりの赤、緑および青の光線を赤、緑および青色用の三枚の液晶パネルに照射し、光変調し、赤、緑および青の映像光線を出射する液晶パネル部と、液晶パネル部よりの赤、緑および青の映像光線を合成し投写する投写部とからなるものにおいて、前記液晶パネルへの照射光線を反射するための反射部を、対応する一色の波長領域の端部を除く領域を反射する第１ダイクロイックミラーと、第１ダイクロイックミラーを透過した前記波長領域の光線を反射する第２ダイクロイックミラーと、前記第１ダイクロイックミラーと第２ダイクロイックミラーとの間に介挿され、第１ダイクロイックミラーからの光線を制御信号にて偏光面を45°回転し、同時に第２ダイクロイックミラーで反射された光線の偏光面を45°回転する第１偏光面回転素子とから構成し、高色彩再現用のときは前記第１偏光面回転素子で偏光面を回転させ、高輝度表示のときは前記第１偏光面回転素子では偏光面を非回転にすることにより、高色彩再現用と高輝度表示用とを切換えるようにした液晶プロジェクタ装置。

【請求項４】　光源からの白色光線を赤、緑および青の光線に分光する分光部と、分光部よりの赤、緑および青

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の光線を赤、緑および青色用の三枚の液晶パネルに照射し、光変調し、赤、緑および青の映像光線を出射する液晶パネル部と、液晶パネル部よりの赤、緑および青の映像光線を合成し投写する投写部とからなるものにおいて、前記液晶パネルへの照射光線を反射するための反射部を、対応する一色の波長領域の端部を除く領域を反射する第１ダイクロイックミラーと、第１ダイクロイックミラーを透過した前記波長領域の端部の光線を反射する全反射ミラーと、前記第１ダイクロイックミラーと全反射ミラーとの間に介挿され、第１ダイクロイックミラーからの光線を制御信号にて偏光面を45°回転し、同時に全反射ミラーで反射された光線の偏光面を45°回転する第１偏光面回転素子とから構成し、高色彩再現用のときは前記第１偏光面回転素子で偏光面を回転させ、高輝度表示のときは前記第１偏光面回転素子では偏光面を非回転にすることにより、高色彩再現用と高輝度表示用とを切換えるようにした液晶プロジェクタ装置。

【請求項５】　前記第１ダイクロイックミラーと第１偏光面回転素子との間に偏光板を介挿すると共に、液晶パネルの入射側に設けられる偏光板を外してなり、前記第１偏光面回転素子を偏光面を回転するように制御したとき、前記第２ダイクロイックミラーまたは全反射ミラーで反射され第１偏光面回転素子を透過した光線が、前記介挿された偏光板により透過を阻止されるようにした請求項３または４記載の液晶プロジェクタ装置。

【請求項６】　光源からの白色光線を赤、緑および青の光線に分光する分光部と、分光部よりの赤、緑および青の光線を赤、緑および青色用の三枚の液晶パネルに照射し、光変調し、赤、緑および青の映像光線を出射する液晶パネル部と、液晶パネル部よりの赤、緑および青の映像光線を合成し投写する投写部とからなるものにおいて、前記液晶パネルへの照射光線を反射するための反射部を、対応する一色の波長領域の端部を除く領域を反射する第１ダイクロイックミラーと、第１ダイクロイックミラーを透過した光線を制御信号にて偏光面を90°回転する第２偏光面回転素子と、第２偏光面回転素子よりの偏光面の回転されないときの光線は反射し、偏光面の回転された光線を透過する第２ＰＢＳとから構成し、高色彩再現用のときは前記第２偏波面回転素子で偏波面を回転させ、高輝度表示のときは前記第２偏波面回転素子では偏波面を非回転にすることにより、高色彩再現用と高輝度表示用とを切換えるようにした液晶プロジェクタ装置。

【請求項７】　光源からの白色光線を赤、緑および青の光線に分光する分光部と、分光部よりの赤、緑および青の光線を赤、緑および青色用の三枚の液晶パネルに照射し、光変調し、赤、緑および青の映像光線を出射する液晶パネル部と、液晶パネル部よりの赤、緑および青の映像光線を合成し投写する投写部とからなるものにおいて、一液晶パネルを照射するための光線を反射し、他の

液晶パネルを照射するための光線を透過させる分光部を、前記一液晶パネルに対応する一色の波長領域の端部を除く領域を反射し、他の色の全波長領域の光線を透過する第３ダイクロイックミラーと、第３ダイクロイックミラーを透過した前記一色の波長領域の光線を反射し、前記他の色の全波長領域の光線を透過する第４ダイクロイックミラーと、前記第３ダイクロイックミラーと第４ダイクロイックミラーとの間に介挿され、第３ダイクロイックミラーからの光線を制御信号にて偏光面を45°回転し、同時に第４ダイクロイックミラーで反射された光線の偏光面を45°回転する第１偏光面回転素子と、前記第４ダイクロイックミラーを透過した光線を前記制御信号にて偏光面を45°回転し次の反射部に送出する第３偏光面回転素子とから構成し、高色彩再現用のときは前記第１偏光面回転素子および第３偏光面回転素子で偏光面を回転させ、高輝度表示のときは前記第１偏光面回転素子および第３偏光面回転素子では偏光面を非回転にすることにより、高色彩再現用と高輝度表示用とを切換えるようにした液晶プロジェクタ装置。

【請求項８】　光源からの白色光線を赤、緑および青の光線に分光する分光部と、分光部よりの赤、緑および青の光線を赤、緑および青色用の三枚の液晶パネルに照射し、光変調し、赤、緑および青の映像光線を出射する液晶パネル部と、液晶パネル部よりの赤、緑および青の映像光線を合成し投写する投写部とからなるものにおいて、一液晶パネルを照射するための光線を反射し、他の液晶パネルを照射するための光線を透過させる分光部を、前記一液晶パネルに対応する一色の波長領域の端部を除く領域を反射し、他の色の全波長領域の光線を透過する第３ダイクロイックミラーと、第３ダイクロイックミラーを透過した光線を制御信号にて偏光面を90°回転する第２偏光面回転素子と、第２偏光面回転素子よりの偏光面の回転されないときの光線は反射し、偏光面の回転された光線を透過し、同時に前記他の色の全波長領域の光線は偏光面の回転・非回転にかかわらず透過する狭帯域特性の第３ＰＢＳと、第３ＰＢＳを透過した光線を前記制御信号にて偏光面を90°回転し次の反射部に送出する第４偏光面回転素子とから構成し、高色彩再現用のときは前記第２偏光面回転素子および第４偏光面回転素子で偏光面を回転させ、高輝度表示のときは前記第２偏光面回転素子および第４偏光面回転素子では偏光面を非回転にすることにより、高色彩再現用と高輝度表示用とを切換えるようにした液晶プロジェクタ装置。

【請求項９】　前記制御信号にて偏光面を回転する第１偏光面回転素子、第２偏光面回転素子および第３偏光面回転素子は、それぞれ液晶層を用いて構成したものでなる請求項３乃至８のいずれかに記載の液晶プロジェクタ装置。

【請求項１０】　前記第１偏光面回転素子または第２偏光面回転素子、および第１ダイクロイックミラー乃至第４ダイクロイックミラーを適宜に重ね、透過光線の波長域を制御するようにした請求項３乃至８のいずれかに記載の液晶プロジェクタ装置。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明は液晶プロジェクタ装置に係り、高輝度表示用と高色彩再現用とを切換えて使用するものに関する。

【０００２】

【従来の技術】液晶プロジェクタ装置では、光源からの白色光線を赤、緑および青の三色に分光し、赤、緑および青色用の液晶パネルを照射し、光変調された光線を合成し、投写レンズでスクリーンに拡大投写する。その際、光源からの光線を有効に利用し投写画像を高輝度にするため、可視波長領域の全てを利用するように分光を行うが、結果として各色の純度が低下し、色彩の再現性が低下する。例えば、主に文字、グラフィック等を表示する用途の場合は高輝度画像が望まれるが、ＴＶ映像を表示する場合は色彩のよい画像が求められる等、用途によって要求が異なり、これらを同時に満足させることは困難である。

【０００３】

【発明が解決しようとする課題】本発明はこのような点に鑑み、光源からの白色光線の分光性能を広帯域用と狭帯域用とに切換える手段を設け、用途に応じて装置を高輝度表示用と高色彩表示用とを切換えられるようにすることを目的とする。

【０００４】

【課題を解決するための手段】上記目的を達成するため、本発明の液晶プロジェクタ装置では、光源からの白色光線を赤、緑および青の光線に分光する分光部と、分光部よりの赤、緑および青の光線を赤、緑および青色用の三枚の液晶パネルに照射し、光変調し、赤、緑および青の映像光線を出射する液晶パネル部と、液晶パネル部よりの赤、緑および青の映像光線を合成し投写する投写部とからなるものにおいて、前記分光部への光路に、赤、緑および青の各色の波長領域の端部領域をカットする第１フィルタを挿抜自在に設け、第１フィルタの挿抜で高色彩再現用と高輝度表示用とを切換えるようにする。

【０００５】なお、前記分光部と、液晶パネル部と、投写部とからなるものにおいて、赤、緑および青の各色の波長領域の端部領域をカットするフィルタ素子を、光源からの光線を集光するためのインテグレータレンズのレンズ素子のピッチと同じピッチでガラス板上に配設して第２フィルタを形成し、第２フィルタをインテグレータレンズとインテグレータレンズからの光線の直線偏光成分の取出しを行う第１ＰＢＳとの間に配置し、第２フィルタを、高色彩再現用のときは光路にフィルタ素子が介挿され、高輝度表示用のときは光路にフィルタ素子が介

挿されないように移動するようにしてもよい。

【０００６】または、前記分光部と、液晶パネル部と、投写部とからなるものにおいて、液晶パネルへの照射光線を反射するための反射部を、対応する一色の波長領域の端部を除く領域を反射する第１ダイクロイックミラー（以降、ＤＭと略す）と、第１ＤＭを透過した前記波長領域の光線を反射する第２ＤＭと、第１ＤＭと第２ＤＭとの間に介挿され、第１ＤＭからの光線を制御信号にて偏光面を45°回転し、同時に第２ＤＭで反射された光線の偏光面を45°回転する第１偏光面回転素子とから構成し、高色彩再現用のときは第１偏光面回転素子で偏光面を回転させ、高輝度表示のときは第１偏光面回転素子では偏光面を非回転にし、高色彩再現用と高輝度表示用とを切換えるようにする。

【０００７】この場合、前記反射部を、前記第１ＤＭと、第１ＤＭを透過した前記波長領域の端部の光線を反射する全反射ミラーと、第１ＤＭと全反射ミラーとの間に前記第１偏光面回転素子を介挿して構成し、高色彩再現用のときは第１偏光面回転素子で偏光面を回転させ、高輝度表示のときは第１偏光面回転素子では偏光面を非回転にし、高色彩再現用と高輝度表示用とを切換える。

【０００８】あるいは、第１ＤＭと第１偏光面回転素子との間に偏光板を介挿すると共に、液晶パネルの入射側に設けられる偏光板を外し、前記第１偏光面回転素子を偏光面を回転するように制御したとき、第２ＤＭまたは全反射ミラーで反射され第１偏光面回転素子を透過した光線が、介挿された偏光板により透過を阻止されるようにしてもよい。

【０００９】または、前記反射部を、前記第１ＤＭと、第１ＤＭを透過した光線を制御信号にて偏光面を90°回転する第２偏光面回転素子と、第２偏光面回転素子よりの偏光面の回転されないときの光線は反射し、偏光面の回転された光線を透過する第２ＰＢＳとから構成し、高色彩再現用のときは第２偏波面回転素子で偏波面を回転させ、高輝度表示のときは第２偏波面回転素子では偏波面を非回転にし、高色彩再現用と高輝度表示用とを切換える。

【００１０】また、一液晶パネルを照射するための光線を反射し、他の液晶パネルを照射するための光線を透過させる分光部を、前記一液晶パネルに対応する一色の波長領域の端部を除く領域を反射し、他の色の全波長領域の光線を透過する第３ＤＭと、第３ＤＭを透過した前記一色の波長領域の光線を反射し、前記他の色の全波長領域の光線を透過する第４ＤＭと、第３ＤＭと第４ＤＭとの間に介挿され、第３ＤＭからの光線を制御信号にて偏光面を45°回転し、同時に第４ＤＭで反射された光線の偏光面を45°回転する第１偏光面回転素子と、第４ＤＭを透過した光線を前記制御信号にて偏光面を45°回転し次の反射部に送出する第３偏光面回転素子とから構成し、高色彩再現用のときは第１偏光面回転素子および第３偏光面回転素子で偏光面を回転させ、高輝度表示のときは第１偏光面回転素子および第３偏光面回転素子では偏光面を非回転にし、高色彩再現用と高輝度表示用とを切換えてもよい。

【００１１】または、前記分光部を、前記第３ＤＭと、第３ＤＭを透過した光線を制御信号にて偏光面を90°回転する第２偏光面回転素子と、第２偏光面回転素子よりの偏光面の回転されないときの光線は反射し、偏光面の回転された光線を透過し、同時に前記他の色の全波長領域の光線は偏光面の回転・非回転にかかわらず透過する波帯域特性の第３ＰＢＳと、第３ＰＢＳを透過した光線を前記制御信号にて偏光面を90°回転し次の反射部に送出する第４偏光面回転素子とから構成し、高色彩再現用のときは第２偏光面回転素子および第４偏光面回転素子で偏光面を回転させ、高輝度表示のときは第２偏光面回転素子および第４偏光面回転素子では偏光面を非回転にし、高色彩再現用と高輝度表示用とを切換える。

【００１２】なお、第１・第２・第３偏光面回転素子はそれぞれ液晶層を用いて構成する。また、第１偏光面回転素子または第２偏光面回転素子、および第１ＤＭ乃至第４ＤＭを適宜に重ね、透過光線の波長域を制御するようにしてもよい。

【００１３】

【発明の実施の形態】発明の実施の形態を実施例に基づき図面を参照して説明する。図１は本発明による液晶プロジェクタ装置の一実施例の要部構成図である。図において、１は白色光線を出射する光源、２および３はインテグレータレンズ、４はレンズ、５、８、12および13はミラー、６は第１フィルタ、７および10はＤＭ、９、11および14は赤、緑、青色用の液晶パネル、15はダイクロイックプリズム、16は投写レンズである。光源１からの白色光線をインテグレータレンズ２、３およびレンズ４で集光し、第１フィルタ６に入射する。第１フィルタ６は装置を高色彩再現用として使用する場合に光路（図の位置）に介挿する。第１フィルタ６は、青光線の波長領域である約410nm から505nm のうちの約420nm から490nm の領域と、緑光線の波長領域である約505nm から580nm のうちの約525nm から565nm の領域と、赤光線の波長領域である約580nm から720nm のうちの約600nmから700nm の領域とを透過させ、これら以外の波長成分を遮断するように形成する。第１フィルタ６を透過した光線はＤＭ７に入射し、Ａ（例えば、赤）光線を透過し、Ｂ（同、緑）光線およびＣ（同、青）光線を反射する。Ａ光線はミラー８で反射し、液晶パネル９を照射する。ＢおよびＣ光線はＤＭ10に入射し、Ｂ光線を反射し、Ｃ光線を透過する。Ｂ光線は液晶パネル11を照射し、Ｃ光線はミラー12および13で反射し、液晶パネル14を照射する。三枚の液晶パネルで光変調された光線はダイクロイックプリズム15で合成し、投写レンズ16でスクリーンに拡大投写する。

【００１４】各液晶パネルを照射する光線は、第１フィルタ６を通った色純度の高い赤、緑および青の光線であるから、投写画像は輝度の面では劣るが色の再現性のよいものとなる。第１フィルタ６を光路から外せば、赤、緑および青のそれぞれ全波長領域の光線が対応する液晶パネルに入射するので、輝度の高い画像を表示することができる。

【００１５】図２は他の実施例の要部構成図で、図の21'は第２フィルタで、図３に示すように、上述の第１フィルタと同じ特性を持つフィルタ素子を、光源からの光線を集光するための出射側のインテグレータレンズ３のレンズ素子のピッチと同じピッチでガラス板上に配設して形成し、インテグレータレンズ３とインテグレータレンズからの光線の直線偏光成分の取出しを行う第１ＰＢＳ31（図２では図示省略）との間に配置する。そして、高色彩再現用のときは光路にフィルタ素子が介挿され（フィルタ21 ON）、高輝度表示用のときは光路にフィルタ素子が介挿されないように（フィルタ21 OFF）第２フィルタ21を移動させる。なお、その他の符号は図１と同じであるので説明を省略する。

【００１６】図４以降は、上述の第１、第２フィルタによらず、電気的制御で高色彩再現用と高輝度表示用とを切換えるもので、以降、全てＳ偏光成分を使用する場合で説明する。なお、図中のS1は、青光線では約420nm から490nm 、緑光線では約525nm から565nm 、赤光線では約600nm から700nm の波長領域のＳ偏光成分を表し、S2は、青光線の約410nm から505nm 、緑光線の約505nm から580nm 、赤光線の約580nm から720nm の各波長領域のうち上記S1以外の領域のＳ偏光成分を表す。

【００１７】図４乃至図７は、図１、２のミラー８およびミラー13の位置（光路Ａおよび光路Ｃ）に用いる反射部の例を示すもので、まず、図４の例では、ＰＢＳ（図示省略）を通ったS1＋S2（Ａ光線またはＣ光線）が第１DM41に入射し、S1を反射し、S2は透過する。高輝度表示用のときは第１偏光面回転素子（液晶層で構成、以降、液晶層と記す）42を偏光面非回転に制御し、第１DM41からのS2をそのまま透過させる。第２DM43はS2を反射するように設定されており、これにより、液晶パネルの液晶部45には偏光板44を経てS1＋S2が照射され、高輝度の変調光線を出射する。高色彩再現用のときは、第１液晶層42（制御信号により入射光線の偏光面を45° 回転）を偏光面回転に制御し、S2の偏光面を45° 回転し、第２DM43で反射させ、第１液晶層42でさらに偏光面を45° 回転し、P2とし、第１DM41を通過させ偏光板44に達する。しかし、Ｐ偏光成分なので偏光板44を透過せず、液晶部45は色純度の高いS1のみで照射され、高色彩の変調光線を出射する。

【００１８】図５の例では、図４の第１DM41と第１液晶層42との間に偏光板51を介挿する。この場合、液晶パネルの偏光板44は不要である。なお、その他の符号は図４と同じである。高輝度表示用のときは、第１DM41を透過したS2は偏光板51と第１液晶層42を透過し、第２DM43で反射され、再度第１液晶層42、偏光板51および第１DM41を透過し、液晶部45を照射する。高色彩再現用のときは、第１DM41を透過したS2は第１液晶層42を往復するので偏光面が90° 回転し、Ｐ偏光成分となるので偏光板51を通過せず、ここで熱となって消費され、結果として液晶パネルの温度上昇を抑制することができる。

【００１９】図６の例では、図４の第２DM43に代えて全反射ミラー61を用いる。その他の符号は図４と同じである。高輝度表示用のときは、第１DM41を透過したS2は第１液晶層42を透過し、全反射ミラー61で反射され、再度第１液晶層42および第１DM41を透過し、偏光板44を経て液晶部45を照射する。高色彩再現用のときは、第１DM41を透過したS2は、第１液晶層42を往復するので偏光面が90° 回転し、Ｐ偏光成分となり、偏光板44を透過できない。図４の第２DM43の代わりに全反射ミラー61を用いるのでコストを低減することができる。

【００２０】図７の例では、図４の第１液晶層42に代えて第２液晶層71（制御信号で偏光面を90° 回転）を用い、第２DM43に代えて第２ＰＢＳ72を用いる。その他の符号は図４と同じである。高輝度表示用のときは、第１DM41を透過したS2は第２液晶層71を透過し、第２ＰＢＳ72で反射され、再度第２液晶層71および第１DM41を透過し、偏光板44を経て液晶部45を照射する。高色彩再現用のときは、第１DM41を透過したS2は第２液晶層71で偏光面が90° 回転され、Ｐ偏光のP2となり、第２ＰＢＳ72を透過するので、液晶部45には照射されない。また、P2は第２ＰＢＳを透過するので、偏光板44には熱負担がかからない。

【００２１】図８および図９は、図１、２のダイクロイックミラー10の位置（光路Ｂ）に用いる分光部の例を示すもので、まず、図８に示す例では、ＰＢＳ（図示省略）を通ったS1＋S2（例えば、Ｂ光線）とS3（例えば、Ｃ光線の全波長領域）が第３DM81に入射する。第３DM81はS1を反射し、S2とS3を透過するように設定されている。高輝度表示用のときは第１液晶層42および第３液晶層83（偏光面補償用）を偏光面非回転に制御する。第３DM81からのS2とS3は第１液晶層42を透過し、第４DM82に入射する。第４DM82はS2を反射しS3を透過するように設定されており、これにより、第４DM82で反射されたS2は第１液晶層42および第３DM81を透過し、液晶パネルの液晶部45には偏光板44を経てS1＋S2が照射され、高輝度の変調光線を出射する。第４DM82を透過したS3は第３液晶層83に入射・透過し、次の反射部（光路Ｃ）に進む。高色彩再現用のときは第１液晶層42および第３液晶層83を偏光面回転に制御する。第３DM81を透過したS2とS3は第１液晶層42で偏光面が45° 回転し、S2は第４DM82で反射され、第１液晶層42でさらに偏光面が45° 回転し、P2となり、第３DM81を通過し、偏光板

44に達するが、Ｐ偏光成分なので偏光板44を透過せず、液晶部45は色純度の高いS1のみで照射され、高色彩の変調光線を出射する。第１液晶層42で偏光面を45°回転された元S3（S3とP3の中間）は第４ＤＭ82を透過し、第３液晶層83に入射し、偏光面が45°回転し、Ｓ偏光成分のS3となり、次の反射部（光路Ｃ）に進む。

【００２２】図９の例では、図８の第１液晶層42に代えて第２液晶層71を、第４ＤＭ82に代えて第３ＰＢＳ91を、第３液晶層83に代えて第４液晶層92（偏光面補償用）を用いる。第３ＰＢＳ91は狭帯域特性のもので、ある色（例えば、Ｂ光線）のＳ偏光成分は反射しＰ偏光成分は透過するが、他の色（例えば、Ｃ光線）はＳ偏光およびＰ偏光の両成分を透過する。第４液晶層92は第２液晶層71と同じ偏光面回転特性のもので、制御信号で入射光の偏光面を90°回転する。その他の符号は図８と同じである。高輝度表示用のときは第２液晶層71および第４液晶層92を偏光面非回転に制御する。第３DM81からのS2とS3は第２液晶層71を透過し、このうちS2は第３ＰＢＳ91で反射され、第２液晶層71および第３DM81を透過し、偏光板44に入射し、S3は第３ＰＢＳ91および第４液晶層92を透過し、次の反射部（光路Ｃ）に進む。高色彩再現用のときは第２液晶層71および第４液晶層92を偏光面回転に制御する。第３DM81を透過したS2とS3は第１液晶層42で偏光面が90°回転し、P2とP3になり、共に第４ＰＢＳ92で偏光面が90°回転され、S2とS3になり、次の反射部（光路Ｃ）に進むので、P2による偏光板44の熱負担がなくなる。

【００２３】なお、上述した第１液晶層または第２液晶層、および第１DM乃至第４DMを適宜に重ねることにより、透過光線の波長域を何段階かに制御するようにできる。また、DMの透過率を制御するようにすれば、三原色の比率を調整することができる。

【００２４】

【発明の効果】以上に説明したように、本発明による液晶プロジェクタ装置によれば、フィルタの切換え操作、または液晶層（偏光面回転素子）の制御で液晶パネルを照射する光線の波長領域を狭帯域または広帯域に切換えることができるので、色の純度を重視する高色彩再現用とするか、または画像の明るさを重視する高輝度表示用とするかを画像内容に応じて切換えることができる。

【図面の簡単な説明】

【図１】本発明による液晶プロジェクタ装置の一実施例の要部構成図である。

【図２】本発明による液晶プロジェクタ装置の他の実施例の要部構成図である。

【図３】図２のフィルタ部分の一例の要部構成図である。

【図４】光路Ａ、Ｃに用いる反射部の一例の要部構成図である。

【図５】光路Ａ、Ｃに用いる反射部の他の例の要部構成図である。

【図６】光路Ａ、Ｃに用いる反射部の他の例の要部構成図である。

【図７】光路Ａ、Ｃに用いる反射部の他の例の要部構成図である。

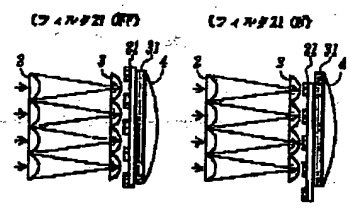
【図８】光路Ｂに用いる分光部の一例の要部構成図である。

【図９】光路Ｂに用いる分光部の他の例の要部構成図である。

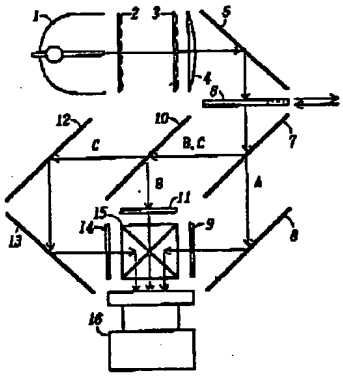
【符号の説明】

1　光源
2、3　インテグレータレンズ
4　集光レンズ
5、8、12、13　ミラー
6、21　第１、第２フィルタ
7、10　ダイクロイックミラー（DM）
9、11、14　液晶パネル
15　ダイクロイックプリズム
16　投写レンズ
31、72、91　第１、第２、第３ＰＢＳ
41、43、81、82　第１、第２、第３、第４ダイクロイックミラー（DM）
42、71、83、92　第１、第２、第３、第４偏光面回転素子（液晶層）
44、51　偏光板
45　液晶部
61　全反射ミラー
S1、S2、S3　S偏光成分
P2、P3　P偏光成分

【図３】



【図１】



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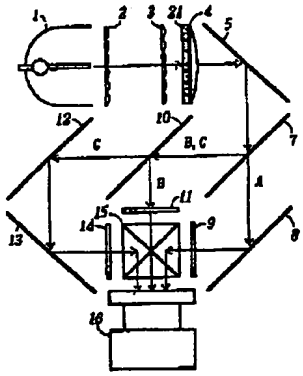

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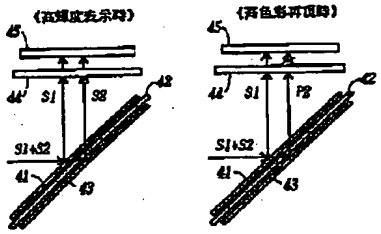

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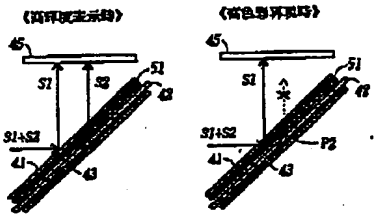

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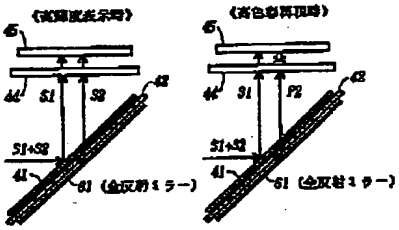

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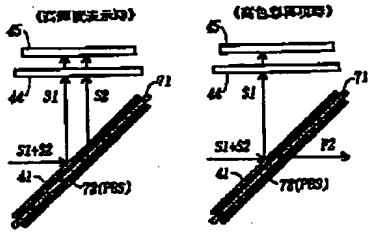

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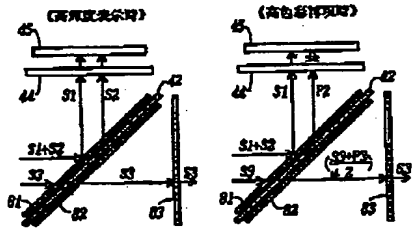

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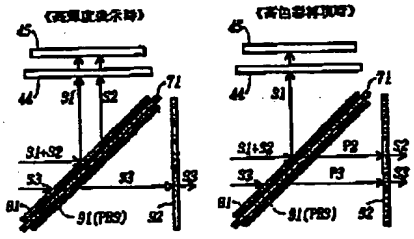

* NOTICES *

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CLAIMS

[Claim(s)]
[Claim 1] what is characterized by providing the following -- setting -- said spectrum -- an optical path to the section -- red and liquid crystal projector equipment which prepares green and the 1st filter which cuts an edge field of a wavelength field of each blue color free [insert and remove], and switched an object for high color reappearance, and an object for daylight displays by insert and remove of the 1st filter a white light line from the light source -- red and a spectrum which carries out a spectrum to light of green and blue -- the section a spectrum -- red from the section -- light of green and blue -- red -- green and a liquid crystal panel of three sheets for blue -- glaring -- light modulation -- carrying out -- red and the liquid crystal panel section which carries out outgoing radiation of green and the blue image light Red from the liquid crystal panel section, the projection section which compounds and projects green and blue image light
[Claim 2] In what is characterized by providing the following red and a filter element which cuts an edge field of green and a wavelength field of each blue color Arrange on a glass plate in the same pitch as a pitch of a lens element of an integrator lens for condensing light from the light source, and the 2nd filter is formed. The 2nd filter is arranged between the 1st PBS (polarization beam splitter) which performs drawing of a linearly polarized light component of light from said integrator lens and integrator lens. It is liquid crystal projector equipment it was made to move so that the 2nd filter is inserted in a filter element by optical path at the time for high color reappearance, and a filter element may not be inserted in an optical path, when it is an object for daylight displays. a white light line from the light source -- red and a spectrum which carries out a spectrum to light of green and blue -- the section a spectrum -- red from the section -- light of green and blue -- red -- green and a liquid crystal panel of three sheets for blue -- glaring -- light modulation -- carrying out -- red and the liquid crystal panel section which carries out outgoing radiation of green and the blue image light Red from the liquid crystal panel section, the projection section which compounds and projects green and blue image light
[Claim 3] Light modulation is glared and carried out to a liquid crystal panel of three sheets of **. a white light line from the light source -- red and a spectrum which carries out a spectrum to light of green and blue -- the section and a spectrum -- red from the section -- light of green and blue -- red -- green and blue -- with red and the liquid crystal panel section which carries out outgoing radiation of green and the blue image light In red from the liquid crystal panel section, and a thing which consists of green and the projection section which compounds and projects blue image light The 1st dichroic mirror which reflects a field except an edge of a wavelength field in Isshiki which corresponds the reflective section for reflecting exposure light to said liquid crystal panel, The 2nd dichroic mirror which reflects light of said wavelength field which penetrated the 1st dichroic mirror, It is inserted between said 1st dichroic mirror and 2nd dichroic mirror. 45 degrees of plane of polarization are rotated for light from the 1st dichroic mirror with a control signal. Plane of polarization of light reflected in coincidence with the 2nd dichroic mirror is constituted from a 1st plane-of-polarization rotation element rotated 45 degrees. It is liquid crystal projector equipment which switched an object for high color reappearance, and an object for daylight displays by rotating plane of polarization with said 1st plane-of-polarization rotation

element at the time for high color reappearance when making plane of polarization into nonrotation with said 1st plane-of-polarization rotation element at the time of a daylight display.
[Claim 4] Light modulation is glared and carried out to a liquid crystal panel of three sheets of **. a white light line from the light source -- red and a spectrum which carries out a spectrum to light of green and blue -- the section and a spectrum -- red from the section -- light of green and blue -- red -- green and blue -- with red and the liquid crystal panel section which carries out outgoing radiation of green and the blue image light In red from the liquid crystal panel section, and a thing which consists of green and the projection section which compounds and projects blue image light The 1st dichroic mirror which reflects a field except an edge of a wavelength field in Isshiki which corresponds the reflective section for reflecting exposure light to said liquid crystal panel, A total reflection mirror which reflects light of an edge of said wavelength field which penetrated the 1st dichroic mirror, It is inserted between said 1st dichroic mirror and total reflection mirrors, and 45 degrees of plane of polarization are rotated for light from the 1st dichroic mirror with a control signal. Plane of polarization of light reflected in coincidence by total reflection mirror is constituted from a 1st plane-of-polarization rotation element rotated 45 degrees. It is liquid crystal projector equipment which switched an object for high color reappearance, and an object for daylight displays by rotating plane of polarization with said 1st plane-of-polarization rotation element at the time for high color reappearance when making plane of polarization into nonrotation with said 1st plane-of-polarization rotation element at the time of a daylight display.
[Claim 5] Liquid crystal projector equipment according to claim 3 or 4 made it light which was reflected by said 2nd dichroic mirror or total reflection mirror, and penetrated the 1st plane-of-polarization rotation element have transparency prevented with said inserted polarizing plate while inserting a polarizing plate between said 1st dichroic mirror and the 1st plane-of-polarization rotation element when it came to remove a polarizing plate prepared in an incidence side of a liquid crystal panel and said 1st plane-of-polarization rotation element was controlled to rotate plane of polarization.
[Claim 6] Light modulation is glared and carried out to a liquid crystal panel of three sheets of **. a white light line from the light source -- red and a spectrum which carries out a spectrum to light of green and blue -- the section and a spectrum -- red from the section -- light of green and blue -- red -- green and blue -- with red and the liquid crystal panel section which carries out outgoing radiation of green and the blue image light In red from the liquid crystal panel section, and a thing which consists of green and the projection section which compounds and projects blue image light The 1st dichroic mirror which reflects a field except an edge of a wavelength field in Isshiki which corresponds the reflective section for reflecting exposure light to said liquid crystal panel, The 2nd plane-of-polarization rotation element which rotates 90 degrees of plane of polarization for light which penetrated the 1st dichroic mirror with a control signal, Light in case [of the 2nd plane-of-polarization rotation element] rotatory polarization is not carried out is reflected. When it constitutes from the 2nd PBS which penetrates light by which rotatory polarization was carried out, plane of polarization is rotated with said 2nd plane-of-polarization rotation element at the time for high color reappearance and plane of polarization is made into nonrotation with said 2nd plane-of-polarization rotation element at the time of a daylight display Liquid crystal projector equipment which switched an object for high color reappearance, and an object for daylight displays.
[Claim 7] Light modulation is glared and carried out to a liquid crystal panel of three sheets of **. a white light line from the light source -- red and a spectrum which carries out a spectrum to light of green and blue -- the section and a spectrum -- red from the section -- light of green and blue -- red -- green and blue -- with red and the liquid crystal panel section which carries out outgoing radiation of green and the blue image light In red from the liquid crystal panel section, and a thing which consists of green and the projection section which compounds and projects blue image light a spectrum which makes light for reflecting light for irradiating 1 liquid crystal panel, and irradiating other liquid crystal panels penetrate -- the section The 3rd dichroic mirror which reflects a field except an edge of a wavelength field in Isshiki corresponding to said 1 liquid crystal panel, and penetrates light of a full wave length field of other colors, The 4th dichroic mirror which reflects light of a wavelength field in said Isshiki which penetrated the 3rd dichroic mirror, and penetrates light of a full wave length field of a color

besides the above, It is inserted between said 3rd dichroic mirror and 4th dichroic mirror. The 1st plane-of-polarization rotation element which rotates 45 degrees of plane of polarization for light from the 3rd dichroic mirror at a control signal, and rotates 45 degrees of plane of polarization of light reflected in coincidence with the 4th dichroic mirror, Light which penetrated said 4th dichroic mirror is constituted from a 3rd plane-of-polarization rotation element which rotates 45 degrees of plane of polarization, and is sent out to the following reflective section with said control signal. When rotating plane of polarization with said 1st plane-of-polarization rotation element and the 3rd plane-of-polarization rotation element at the time for high color reappearance and making plane of polarization into nonrotation with said 1st plane-of-polarization rotation element and the 3rd plane-of-polarization rotation element at the time of a daylight display Liquid crystal projector equipment which switched an object for high color reappearance, and an object for daylight displays.

[Claim 8] Light modulation is glared and carried out to a liquid crystal panel of three sheets of **. a white light line from the light source -- red and a spectrum which carries out a spectrum to light of green and blue -- the section and a spectrum -- red from the section -- light of green and blue -- red -- green and blue -- with red and the liquid crystal panel section which carries out outgoing radiation of green and the blue image light In red from the liquid crystal panel section, and a thing which consists of green and the projection section which compounds and projects blue image light a spectrum which makes light for reflecting light for irradiating 1 liquid crystal panel, and irradiating other liquid crystal panels penetrate -- the section The 3rd dichroic mirror which reflects a field except an edge of a wavelength field in Isshiki corresponding to said 1 liquid crystal panel, and penetrates light of a full wave length field of other colors, The 2nd plane-of-polarization rotation element which rotates 90 degrees of plane of polarization for light which penetrated the 3rd dichroic mirror with a control signal, The 3rd PBS of a narrow-band property which reflects light in case [of the 2nd plane-of-polarization rotation element] rotatory polarization is not carried out, penetrates light by which rotatory polarization was carried out, and penetrates light of a full wave length field of a color besides the above irrespective of rotatory polarization and nonrotation to coincidence, Light which penetrated the 3rd PBS is constituted from a 4th plane-of-polarization rotation element which rotates 90 degrees of plane of polarization, and is sent out to the following reflective section with said control signal. When rotating plane of polarization with said 2nd plane-of-polarization rotation element and the 4th plane-of-polarization rotation element at the time for high color reappearance and making plane of polarization into nonrotation with said 2nd plane-of-polarization rotation element and the 4th plane-of-polarization rotation element at the time of a daylight display Liquid crystal projector equipment which switched an object for high color reappearance, and an object for daylight displays.

[Claim 9] The 1st plane-of-polarization rotation element, the 2nd plane-of-polarization rotation element, and the 3rd plane-of-polarization rotation element which rotate plane of polarization with said control signal are liquid crystal projector equipment according to claim 3 to 8 which comes to be what was constituted using a liquid crystal layer, respectively.

[Claim 10] Liquid crystal projector equipment according to claim 3 to 8 which piles up suitably said 1st plane-of-polarization rotation element or the 2nd plane-of-polarization rotation element and the 1st dichroic mirror thru/or the 4th dichroic mirror, and controlled a wavelength region of transmitted light.

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[The technical field to which invention belongs] This invention relates to liquid crystal projector equipment, and relates to what switches and uses the object for daylight displays, and the object for high color reappearance.
[0002]
[Description of the Prior Art] With liquid crystal projector equipment, the spectrum of the white light line from the light source is carried out to three colors of red, green, and blue, green and the liquid crystal panel for blue are irradiated, red and the light by which light modulation was carried out are compounded, and expansion projection is carried out with a projection lens at a screen. Although a spectrum is performed so that all the visible wavelength fields may be used in order to use the light from the light source effectively and to make a projection image into high brightness in that case, the purity of each color falls as a result and the repeatability of color falls. For example, in the case of the use which mainly displays an alphabetic character, a graphic, etc., a high brightness image is desired, but when displaying TV image, the thing for which demands differ and these are satisfied to coincidence by the use -- the good image of color is called for -- is difficult.
[0003]
[Problem(s) to be Solved by the Invention] such [this invention] a point -- taking an example -- the spectrum of the white light line from the light source -- the means which switches the engine performance to the object for broadbands and narrow-bands is established, and it aims at the object for daylight displays and the object for a high color display being switched for equipment according to a use.
[0004]
[Means for Solving the Problem] In order to attain the above-mentioned purpose, with liquid crystal projector equipment of this invention Light modulation is glared and carried out to a liquid crystal panel of three sheets of **. a white light line from the light source -- red and a spectrum which carries out a spectrum to light of green and blue -- the section and a spectrum -- red from the section -- light of green and blue -- red -- green and blue -- with red and the liquid crystal panel section which carries out outgoing radiation of green and the blue image light In red from the liquid crystal panel section, and a thing which consists of green and the projection section which compounds and projects blue image light said spectrum -- red and the 1st filter which cuts an edge field of green and a wavelength field of each blue color are prepared in an optical path to the section free [insert and remove], and an object for high color reappearance and an object for daylight displays are switched to it by insert and remove of the 1st filter.
[0005] In what consists of the section, the liquid crystal panel section, and the projection section in addition, said spectrum -- Red and a filter element which cuts an edge field of green and a wavelength field of each blue color Arrange on a glass plate in the same pitch as a pitch of a lens element of an integrator lens for condensing light from the light source, and the 2nd filter is formed. The 2nd filter is

arranged between the 1st PBS which performs drawing of a linearly polarized light component of light from an integrator lens and an integrator lens. It is inserted in a filter element by optical path, and when it is an object for daylight displays, you may make it move the 2nd filter at the time for high color reappearance, so that a filter element may not be inserted in an optical path.
[0006] In what consists of the section, the liquid crystal panel section, and the projection section or said spectrum -- The 1st dichroic mirror which reflects a field except an edge of a wavelength field in Isshiki which corresponds the reflective section for reflecting exposure light to a liquid crystal panel (it abbreviates to DM henceforth), It is inserted between the 2nd DM which reflects light of said wavelength field which penetrated the 1st DM, and the 1st DM and the 2nd DM. It constitutes from a 1st plane-of-polarization rotation element which rotates 45 degrees of plane of polarization for light from the 1st DM at a control signal, and rotates 45 degrees of plane of polarization of light reflected in coincidence with the 2nd DM. Rotating plane of polarization with the 1st plane-of-polarization rotation element at the time for high color reappearance, with the 1st plane-of-polarization rotation element, plane of polarization is made into nonrotation at the time of a daylight display, and it switches an object for high color reappearance, and an object for daylight displays.
[0007] In this case, a total reflection mirror which reflects light of an edge of said wavelength field which penetrated said 1st DM and the 1st DM for said reflective section, Said 1st plane-of-polarization rotation element is inserted and constituted between the 1st DM and a total reflection mirror, plane of polarization is rotated with the 1st plane-of-polarization rotation element at the time for high color reappearance, with the 1st plane-of-polarization rotation element, plane of polarization is made into nonrotation at the time of a daylight display, and it switches an object for high color reappearance, and an object for daylight displays.
[0008] Or while inserting a polarizing plate between the 1st DM and the 1st plane-of-polarization rotation element, you may make it light which removed a polarizing plate prepared in an incidence side of a liquid crystal panel, was reflected by the 2nd DM or total reflection mirror when said 1st plane-of-polarization rotation element was controlled to rotate plane of polarization, and penetrated the 1st plane-of-polarization rotation element have transparency prevented by inserted polarizing plate.
[0009] Or the 2nd plane-of-polarization rotation element which rotates 90 degrees of plane of polarization for light which penetrated said 1st DM and the 1st DM for said reflective section with a control signal, Light in case [of the 2nd plane-of-polarization rotation element] rotatory polarization is not carried out is reflected. It constitutes from the 2nd PBS which penetrates light by which rotatory polarization was carried out, and plane of polarization is rotated with the 2nd plane-of-polarization rotation element at the time for high color reappearance, with the 2nd plane-of-polarization rotation element, plane of polarization is made into nonrotation at the time of a daylight display, and it switches an object for high color reappearance, and an object for daylight displays.
[0010] moreover, a spectrum which makes light for reflecting light for irradiating 1 liquid crystal panel, and irradiating other liquid crystal panels penetrate -- the section The 3rd DM which reflects a field except an edge of a wavelength field in Isshiki corresponding to said 1 liquid crystal panel, and penetrates light of a full wave length field of other colors, The 4th DM which reflects light of a wavelength field in said Isshiki which penetrated the 3rd DM, and penetrates light of a full wave length field of a color besides the above, The 1st plane-of-polarization rotation element which is inserted between the 3rd DM and the 4th DM, rotates 45 degrees of plane of polarization for light from the 3rd DM at a control signal, and rotates 45 degrees of plane of polarization of light reflected in coincidence with the 4th DM, Light which penetrated the 4th DM is constituted from a 3rd plane-of-polarization rotation element which rotates 45 degrees of plane of polarization, and is sent out to the following reflective section with said control signal. Plane of polarization is rotated with the 1st plane-of-polarization rotation element and the 3rd plane-of-polarization rotation element at the time for high color reappearance, with the 1st plane-of-polarization rotation element and the 3rd plane-of-polarization rotation element, plane of polarization may be made into nonrotation at the time of a daylight display, and it may switch an object for high color reappearance, and an object for daylight displays.
[0011] or said spectrum -- light which penetrated said 3rd DM and the 3rd DM for the section with a

control signal with the 2nd plane-of-polarization rotation element turning around 90 degrees of plane of polarization The 3rd PBS of a narrow-band property which reflects light in case [of the 2nd plane-of-polarization rotation element] rotatory polarization is not carried out, penetrates light by which rotatory polarization was carried out, and penetrates light of a full wave length field of a color besides the above irrespective of rotatory polarization and nonrotation to coincidence, Light which penetrated the 3rd PBS is constituted from a 4th plane-of-polarization rotation element which rotates 90 degrees of plane of polarization, and is sent out to the following reflective section with said control signal. Rotating plane of polarization with the 2nd plane-of-polarization rotation element and the 4th plane-of-polarization rotation element at the time for high color reappearance, with the 2nd plane-of-polarization rotation element and the 4th plane-of-polarization rotation element, plane of polarization is made into nonrotation at the time of a daylight display, and it switches an object for high color reappearance, and an object for daylight displays.

[0012] the [in addition,] -- 1 and the 2nd-3rd plane-of-polarization rotation element are constituted using a liquid crystal layer, respectively. Moreover, the 1st plane-of-polarization rotation element or the 2nd plane-of-polarization rotation element and the 1st DM thru/or the 4th DM are piled up suitably, and you may make it control a wavelength region of transmitted light.

[0013]

[Embodiment of the Invention] The gestalt of implementation of invention is explained with reference to a drawing based on an example. Drawing 1 is the important section block diagram of one example of the liquid crystal projector equipment by this invention. the light source to which 1 carries out outgoing radiation of the white light line in drawing, and 2 and 3 -- an integrator lens and 4 -- for the 1st filter, and 7 and 10, as for red, green, the liquid crystal panel for blue, and 15, DM, and 9, 11 and 14 are [a lens, and 5, 8, 12 and 13 / a mirror and 6 / a dichroic prism and 16] projection lenses. The white light line from the light source 1 is condensed with the integrator lenses 2 and 3 and a lens 4, and incidence is carried out to the 1st filter 6. The 1st filter 6 is inserted in an optical path (location of drawing) when using equipment as an object for high color reappearance. about 410nm whose 1st filter 6 is the wavelength field of a blue light line from -- 505nm About 420nm from -- 490nm With a field about 505nm which is the wavelength field of green light from -- 580nm About 525nm from -- 565nm With a field about 580nm which is the wavelength field of a red sunset line from -- 720nm About 600 to 700nm A field is made to penetrate, and it forms so that wavelength components other than these may be intercepted. Incidence of the light which penetrated the 1st filter 6 is carried out to DM7, it penetrates A (for example, red) light, and reflects B (green [** and]) light and C (**, blue) light. It reflects by the mirror 8 and A light irradiates a liquid crystal panel 9. Incidence of B and the C light is carried out to DM10, they reflect B light, and penetrate C light. B light irradiates a liquid crystal panel 11, it reflects by mirrors 12 and 13, and C light irradiates a liquid crystal panel 14. The light by which light modulation was carried out with the liquid crystal panel of three sheets is compounded with a dichroic prism 15, and carries out expansion projection with the projection lens 16 at a screen.

[0014] Since the light which irradiates each liquid crystal panel is light of the high red of the color purity which passed along the 1st filter 6, green, and blue, although a projection image is inferior in respect of brightness, it becomes what has the good repeatability of a color. If the 1st filter 6 is removed from an optical path, since incidence will be carried out to the liquid crystal panel of red, green, and blue with which the light of a full wave length field corresponds, respectively, an image with high brightness can be displayed.

[0015] As drawing 2 is the important section block diagram of other examples, 21 of drawing is the 2nd filter and it is shown in drawing 3 A filter element with the same property as the 1st above-mentioned filter is arranged and formed on a glass plate in the same pitch as the pitch of the lens element of the integrator lens 3 by the side of the outgoing radiation for condensing the light from the light source. It arranges between 1st PBS31 (drawing 2 illustration abbreviation) which performs drawing of the linearly polarized light component of the light from the integrator lens 3 and an integrator lens. As [insert / when it is an object for daylight displays / and / a filter element is inserted in an optical path (filter 21 ON), and / at the time for high color reappearance, / in an optical path / a filter element] (filter

21 OFF) The 2nd filter 21 is moved. In addition, since other signs are the same as drawing 1 , explanation is omitted.

[0016] After drawing 4 , it is not based on the 1st and 2nd above-mentioned filter, but it switches the object for high color reappearance, and the object for daylight displays by electric control, and explains them by the case where S polarization component is used altogether, henceforth. S1 [in addition,] in drawing -- a blue light line -- about 420nm from -- 490nm green light -- about 525nm from -- 565nm and a red sunset line -- about 600nm from -- 700nm S polarization component of a wavelength field is expressed. S2 about 410nm of a blue light line from -- 505nm and about 505nm of green light from -- 580nm and about 580nm of a red sunset line from -- 720nm S polarization component of fields other than the above-mentioned S1 is expressed among each wavelength field.

[0017] Drawing 4 thru/or drawing 7 show the example of the reflective section used for the location (an optical path A and an optical path C) of drawing 1 , the mirror 8 of 2, and a mirror 13, first, in the example of drawing 4 , S1+S2 (A light or C light) which passed along PBS (illustration abbreviation) carries out incidence to 1st DM41, S1 is reflected, and S2 penetrates. The 1st plane-of-polarization rotation element (a liquid crystal layer describes a liquid crystal layer a configuration and henceforth) 42 is controlled to plane-of-polarization nonrotation at the time for daylight displays, and it makes S2 from 1st DM41 penetrate as they are. It is set up as 2nd DMS2 reflected in 43, and thereby, S1+S2 are irradiated by the liquid crystal section 45 of a liquid crystal panel through a polarizing plate 44, and outgoing radiation of the modulation light of high brightness is carried out. At the time for high color reappearance, the 1st liquid crystal layer 42 (45 degrees of plane of polarization of an incident ray are rotated with a control signal) is controlled to plane-of-polarization rotation, 45 degrees of plane of polarization of S2 are rotated, it is made to reflect with 2nd DM43, and 45 degrees of plane of polarization are further rotated in the 1st liquid crystal layer 42, it sets it to P2, passes 1st DM41, and reaches a polarizing plate 44. However, since it is P polarization component, a polarizing plate 44 is not penetrated, but the liquid crystal section 45 is irradiated only by S1 with high color purity, and carries out outgoing radiation of the modulation light of high color.

[0018] In the example of drawing 5 , a polarizing plate 51 is inserted between 1st DM41 of drawing 4 , and the 1st liquid crystal layer 42. In this case, the polarizing plate 44 of a liquid crystal panel is unnecessary. In addition, other signs are the same as drawing 4. S2 to which 1st DM41 was penetrated at the time for daylight displays penetrates a polarizing plate 51 and the 1st liquid crystal layer 42, it is reflected with 2nd DM43, and it penetrates the 1st liquid crystal layer 42, a polarizing plate 51, and 1st DM41 again, and irradiates the liquid crystal section 45. Since it goes and comes back to the 1st liquid crystal layer 42, 90 degrees of plane of polarization rotate, since S2 to which 1st DM41 was penetrated at the time for high color reappearance becomes P polarization component, it does not pass a polarizing plate 51, but becomes heat here, is consumed, and can control the temperature rise of a liquid crystal panel as a result.

[0019] In the example of drawing 6 , it replaces with 2nd DM43 of drawing 4 , and a total reflection mirror 61 is used. Other signs are the same as drawing 4 . S2 to which 1st DM41 was penetrated at the time for daylight displays penetrates the 1st liquid crystal layer 42, it is reflected by the total reflection mirror 61, and it penetrates the 1st liquid crystal layer 42 and 1st DM41 again, and irradiates the liquid crystal section 45 through a polarizing plate 44. Since S2 to which 1st DM41 was penetrated at the time for high color reappearance goes and comes back to the 1st liquid crystal layer 42, 90 degrees of plane of polarization rotate, and it becomes P polarization component, and cannot penetrate a polarizing plate 44. Since a total reflection mirror 61 is used instead of 2nd DM43 of drawing 4 , cost can be reduced.

[0020] In the example of drawing 7 , it replaces with the 1st liquid crystal layer 42 of drawing 4 , replaces with 2nd DM43 using the 2nd liquid crystal layer 71 (90 degrees of plane of polarization are rotated with a control signal), and 2nd PBS72 is used. Other signs are the same as drawing 4 . S2 to which 1st DM41 was penetrated at the time for daylight displays penetrates the 2nd liquid crystal layer 71, it is reflected by 2nd PBS72, and it penetrates the 2nd liquid crystal layer 71 and 1st DM41 again, and irradiates the liquid crystal section 45 through a polarizing plate 44. Since 90 degrees of plane of polarization rotate in the 2nd liquid crystal layer 71, S2 to which 1st DM41 was penetrated at the time

for high color reappearance turns into P2 of P polarization and 2nd PBS72 is penetrated, the liquid crystal section 45 does not glare. Moreover, since P2 penetrates the 2nd PBS, a heat burden is not placed on a polarizing plate 44 by it.

[0021] the spectrum which uses drawing 8 and drawing 9 for the location (optical path B) of drawing 1 and the dichroic mirror 10 of 2 -- the example of the section is shown and S1+S2 (for example, B light) which passed along PBS (illustration abbreviation), and S3 (for example, full wave length field of C light) carry out incidence to 3rd DM81 first in the example shown in drawing 8 . 81 reflect 3rd DMS1, and it is set up so that S2 and S3 may be penetrated. The 1st liquid crystal layer 42 and the 3rd liquid crystal layer 83 (for plane-of-polarization compensation) are controlled to plane-of-polarization nonrotation at the time for daylight displays. S2 and S3 from 3rd DM81 penetrate the 1st liquid crystal layer 42, and it carries out incidence to 4th DM82. It is set up so that 82 may reflect 4th DMS2 and S3 may be penetrated, and thereby, the 1st liquid crystal layer 42 and 3rd DM81 are penetrated, S1+S2 are irradiated by the liquid crystal section 45 of a liquid crystal panel through a polarizing plate 44, and S2 reflected with 4th DM82 carries out outgoing radiation of the modulation light of high brightness. The incidence and the transparency of S3 which penetrated 4th DM82 are done at the 3rd liquid crystal layer 83, and it progresses to the following reflective section (optical path C). The 1st liquid crystal layer 42 and the 3rd liquid crystal layer 83 are controlled to plane-of-polarization rotation at the time for high color reappearance. Although are reflected with 4th DM82, and 45 degrees of plane of polarization rotate further in the 1st liquid crystal layer 42, S2 turns into [as for S2 and S3 which penetrated 3rd DM81, 45 degrees of plane of polarization rotate in the 1st liquid crystal layer 42,] P2, 3rd DM81 is passed and a polarizing plate 44 is reached Since it is P polarization component, a polarizing plate 44 is not penetrated, but the liquid crystal section 45 is irradiated only by S1 with high color purity, and carries out outgoing radiation of the modulation light of high color. 4th DM82 is penetrated, incidence is carried out to the 3rd liquid crystal layer 83, 45 degrees of plane of polarization rotate, and the origin S3 (middle of S3 and P3) which rotated 45 degrees of plane of polarization in the 1st liquid crystal layer 42 is set to S3 of S polarization component, and progresses to the following reflective section (optical path C).

[0022] In the example of drawing 9 , it replaces with the 1st liquid crystal layer 42 of drawing 8 , the 2nd liquid crystal layer 71 is replaced with 4th DM82, 3rd PBS91 is replaced with the 3rd liquid crystal layer 83, and the 4th liquid crystal layer 92 (for plane-of-polarization compensation) is used. Although 3rd PBS91 is the thing of a narrow-band property, S polarization component of a certain color (for example, B light) is reflected and P polarization component is penetrated, other colors (for example, C light) penetrate both the components of S polarization and P polarization. The 4th liquid crystal layer 92 is the thing of the same plane-of-polarization rotation property as the 2nd liquid crystal layer 71, and rotates 90 degrees of plane of polarization of incident light with a control signal. Other signs are the same as drawing 8 . The 2nd liquid crystal layer 71 and the 4th liquid crystal layer 92 are controlled to plane-of-polarization nonrotation at the time for daylight displays. S2 and S3 from 3rd DM81 penetrate the 2nd liquid crystal layer 71, among these it is reflected by 3rd PBS91, S2 penetrates the 2nd liquid crystal layer 71 and 3rd DM81, incidence is carried out to a polarizing plate 44, and S3 penetrates 3rd PBS91 and the 4th liquid crystal layer 92, and progresses to the following reflective section (optical path C). The 2nd liquid crystal layer 71 and the 4th liquid crystal layer 92 are controlled to plane-of-polarization rotation at the time for high color reappearance. Since 90 degrees of plane of polarization rotate in the 1st liquid crystal layer 42, and S2 and S3 which penetrated 3rd DM81 turn into P2 and P3, and 90 degrees of plane of polarization rotate by 4th PBS92 both, it is set to S2 and S3 and it progresses to the following reflective section (optical path C), the heat burden of the polarizing plate 44 by P2 is lost.

[0023] In addition, the wavelength region of the transmitted light can be controlled to several steps by piling up suitably the 1st liquid crystal layer mentioned above or the 2nd liquid crystal layer and the 1st DM thru/or the 4th DM. Moreover, if the permeability of DM is controlled, a ratio in three primary colors can be adjusted.

[0024]

[Effect of the Invention] Since the wavelength field of the light which irradiates a liquid crystal panel by change actuation of a filter or control of a liquid crystal layer (plane-of-polarization rotation element) can be switched to a narrow-band or a broadband according to the liquid crystal projector equipment by this invention as explained above, according to the contents of an image, it can switch whether it carries out to the high color reappearance which thinks the purity of a color as important, or it carries out to the daylight displays which think the brightness of an image as important.

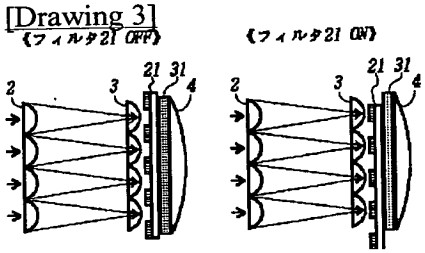
[Translation done.]

* NOTICES *

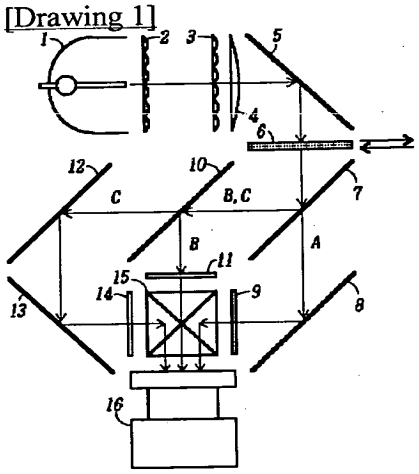
1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

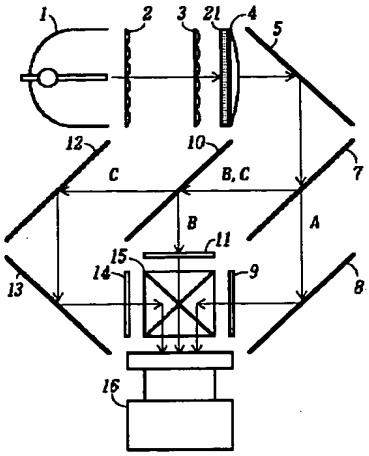
[Drawing 3]



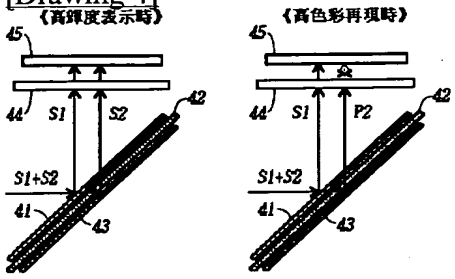
[Drawing 1]



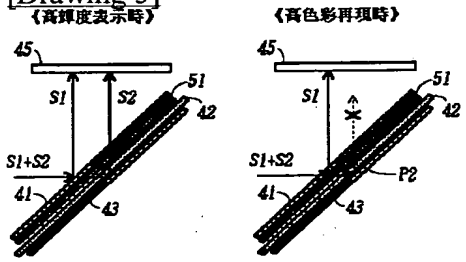
[Drawing 2]



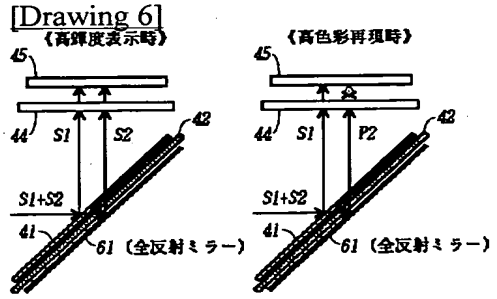
[Drawing 4]



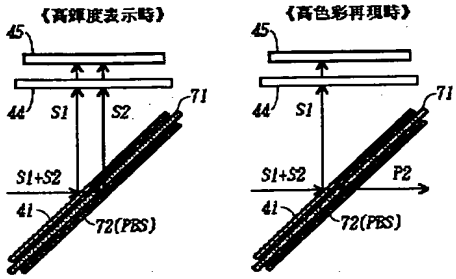
[Drawing 5]



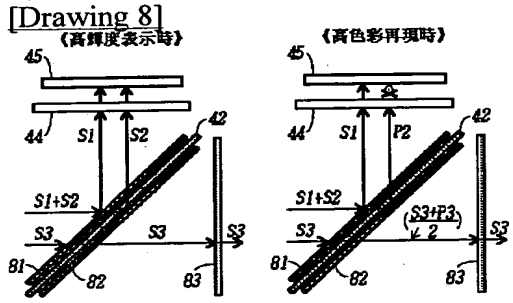
[Drawing 6]



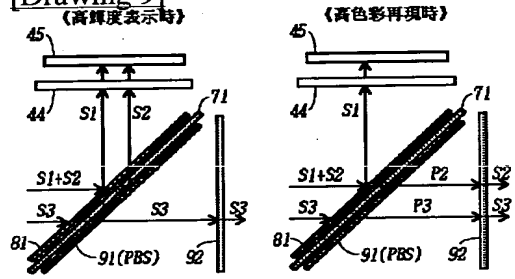
[Drawing 7]



[Drawing 8]



[Drawing 9]



[Translation done.]